PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : F01N 1/16

A1

(11) International Publication Number: WO 97/40264

(43) International Publication Date: 30 October 1997 (30.10.97)

(21) International Application Number: PCT/NL97/00204

(22) International Filing Date: 21 April 1997 (21.04.97)

(30) Priority Data:

1002921	22 April 1996 (22.04.96)	NL
60/016,120	24 April 1996 (24.04.96)	US

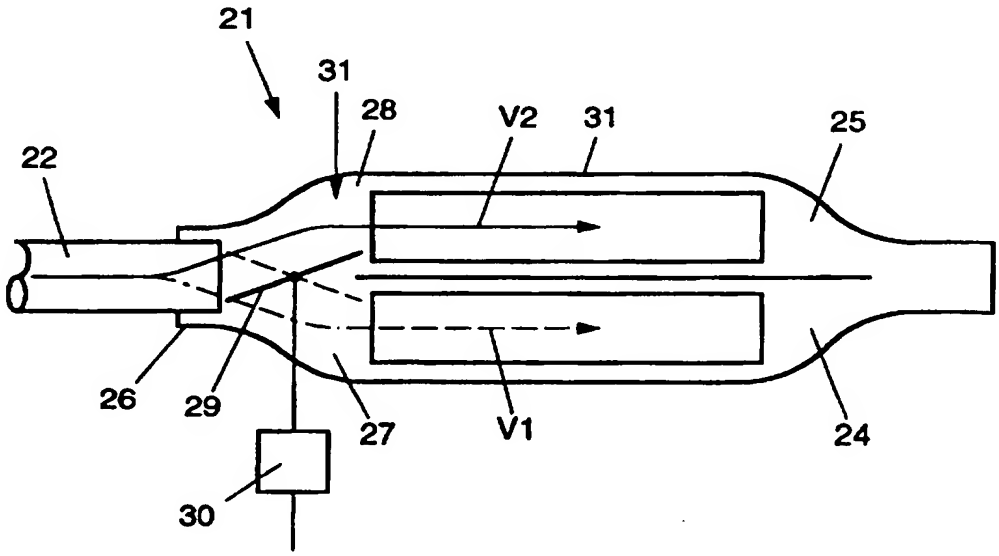
(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
In English translation (filed in Dutch).

(71)(72) Applicant and Inventor: MEUSEN, Wilhelmus, Lambertus, Arnoldus [NL/NL]; Pastoor Vranckenlaan 49, NL-5953 CN Reuver (NL).

(74) Agent: SMULDERS, Th., A., H., J.; Vereenigde Octrooibureaux, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).

(54) Title: EXHAUST ASSEMBLY FOR USE WITH COMBUSTION ENGINES, AND VEHICLE PROVIDED WITH SUCH ASSEMBLY



(57) Abstract

An exhaust assembly for use with a motor vehicle having a combustion engine, which exhaust assembly comprises combustion engine-connecting means, at least one exhaust and at least one muffler, wherein means are provided for controlling the damping characteristic of the exhaust assembly. The exhaust assembly comprises at least a first combustion gas flow route and a second combustion gas flow route, wherein the means for controlling the damping characteristic are operable during use of the exhaust assembly with a combustion engine coupled thereto and are adapted to guide the combustion gases of the engine at least partly along one of the combustion gas flow routes.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania
AM	Armenia
AT	Austria
AU	Australia
AZ	Azerbaijan
BA	Bosnia and Herzegovina
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
BY	Belarus
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CN	China
CU	Cuba
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GE	Georgia
GH	Ghana
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
JP	Japan
KE	Kenya
KG	Kyrgyzstan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
KZ	Kazakstan
LC	Saint Lucia
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LT	Lithuania
LU	Luxembourg
LV	Latvia
MC	Monaco
MD	Republic of Moldova
MG	Madagascar
MK	The former Yugoslav Republic of Macedonia
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
MX	Mexico
NE	Niger
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SN	Senegal
SZ	Swaziland
TD	Chad
TG	Togo
TJ	Tajikistan
TM	Turkmenistan
TR	Turkey
TT	Trinidad and Tobago
UA	Ukraine
UG	Uganda
US	United States of America
UZ	Uzbekistan
VN	Viet Nam
YU	Yugoslavia
ZW	Zimbabwe

Title: Exhaust assembly for use with combustion engines, and vehicle provided with such assembly.

The invention relates to an exhaust assembly of the type described in the preamble of the main claim. Such assembly is known from practice and is supplied in the Netherlands by the firm Dreyson of Uden.

The known assembly comprises an exhaust connectable to an engine of, in particular, a motorbike, which exhaust consists of a pipe having a muffler included therein. Adjacent the end of the exhaust which, during use, is remote from the engine, a series of disks is included. During use of the engine, the exhaust gases are guided along the disks, creating a particular damping characteristic, depending on the number of disks arranged one behind the other. In order to adjust the damping characteristic, disks can be added or removed, both of which influence in particular the noise produced during use and the back pressure of the exhaust.

In order to change the number of disks in this exhaust assembly, a series of fastening screws should be unscrewed, after which disks can be removed or added. Then, the fastening screws should be placed back again, possibly after replacement by screws of a different length. Next, the engine can be started again for checking the change of the damping characteristic, after which, if necessary, the number of disks should be adjusted once again. In this manner, the suitable number of disks can iteratively be determined. A major drawback of this assembly is that each time when the damping characteristic is to be adjusted, the engine should be switched off and the above series of operations should be performed, usually a number of times in succession, while, moreover, replacement parts and tools are necessary. As a consequence, the means for adjusting the damping characteristic are unsuitable for quickly and readily adjusting the damping characteristic. In particular, this cannot be performed with a switched-on engine, as the pressure and temperature of the combustion gases are so high

that handling the exhaust assembly, in particular the inside thereof, is not possible without the danger of burning oneself.

The object of the invention is to provide an assembly of the type described in the preamble of the main claim, in which the drawbacks mentioned are avoided and the advantages thereof are retained. To that end, an exhaust assembly according to the invention is characterized by the features of the characterizing part of claim 1.

An exhaust assembly according to the invention comprises at least a first and a second combustion gas flow route. During use, when two different combustion gas flow routes are present, the combustion gases are selectively guided via the first, partly via the first and partly via the second, or, possibly, entirely via the second combustion gas flow route. By operating the control means, the ratio between the amount of combustion gases flowing via each of the combustion gas flow routes can be set, during use. If for instance 100% of the combustion gases is guided via the first combustion gas flow route, the damping characteristic of the exhaust assembly is determined by the damping characteristic of the first combustion gas flow route. However, if a portion of the combustion gases is guided along the second combustion gas flow route, a damping characteristic is created which is a combination of the damping characteristics of the two combustion gas flow routes. In this manner, the exhaust noise can for instance be controlled by operating the control means.

As the combustion gas flow routes in the exhaust assembly are defined and can be switched on selectively without requiring disassembly and assembly operations and the like, the noise produced by a vehicle in which the exhaust assembly is used can, during use, in each case be adjusted as desired or as necessary, in respect of pitch and key as well as volume. This is in particular very advantageous if the vehicle is for instance used in areas where different or

changing noise standards prevail for the allowed noise production by a vehicle, such as a border region where the border is passed. Further, an exhaust assembly according to the invention offers the advantage that if different users of a vehicle have different noise preferences or if users have different noise preferences at different moments and in different situations, the noise can readily be adjusted during use. Moreover, with an exhaust assembly according to the invention, adjustment of the back pressure provided by the exhaust assembly can be effected in a simple manner and during use. All this can be realized while retaining the possibility of getting back without any difficulty the noise that is considered authentic, if so desired.

In an advantageous embodiment, an exhaust assembly according to the invention is characterized by the features of claim 3.

In such assembly, different exhausts can be used that can selectively be actuated, for processing the complete flow of combustion gases or a portion thereof. This for instance involves the first combustion gas flow route comprising a first exhaust and the second combustion gas flow route comprising another exhaust. One of the exhausts may for instance be the officially allowed standard exhaust and the other exhaust a custom exhaust.

In a further advantageous elaboration, an assembly according to the invention is characterized by the features of claims 4 and 5.

The valve means provide the advantage that in a simple manner, a suitable choice between the exhausts present can in each case be made. By means of the valve means, the complete flow of combustion gases can be guided through one of the exhausts or be distributed over a series of exhausts. By providing the manifold with passages having different flow resistances, the advantage is achieved that the valve means need only be arranged in the passage having the lowest flow resistance. After all, if both passages are released, the

combustion gases will in each case at least substantially choose the passage having the lowest resistance. Only when that passage is closed will the combustion gases be guided via the second or further passage. As a result, constructionally simple, robust and readily operable valve means can be used that are little susceptible to, for instance, deposit formation and damage.

In an alternative embodiment, an exhaust assembly according to the invention is characterized by the features of claim 7.

During use, the covering means release a portion of a muffler for being flown through by the combustion gases. Upon the release of a larger portion of the muffler, at least a greater damping, less noise and a change of the back pressure will be created. Accordingly, a variation in the damping characteristic of the exhaust assembly can already be obtained with one exhaust, which variation can be controlled during use.

In a further embodiment, an exhaust assembly according to the invention is characterized by the features of claim 9.

During use, the combustion gases of the combustion engine flow through and around the muffler elements. In this connection, the interspace between the muffling elements is substantially the determining factor for the degree of damping and, accordingly, the damping characteristic of the exhaust assembly. Hence, by increasing or reducing this interspace at least at a number of muffling elements, a variable damping characteristic is obtained during use in a simple manner and by constructionally simple means. The muffler elements can for instance be disk-shaped and be forced apart by spring means, with pulling means being provided for moving the muffler elements towards each other.

In further elaboration, an exhaust assembly according to the invention is preferably characterized by the features of claim 10.

As the means for controlling the damping characteristic are remotely controllable, the advantage is achieved that these means and, accordingly, the damping characteristic, are for instance controllable from a driver's position of a vehicle provided with the exhaust assembly, so that the damping characteristic can be adjusted during use without the vehicle having to be brought to a stop therefor. Moreover, this does not involve the danger of the burning of parts of the body and clothes and the like of the person who operates the means. Moreover, this enables fine-tuning of the noise in a simpler manner.

The invention further relates to diversion and switching means and a manifold for use in an exhaust assembly according to the invention.

The invention moreover relates to a vehicle comprising an exhaust assembly according to the invention, in particular a motorbike, moped or motorcar.

To explain the invention, exemplary embodiments of an exhaust assembly will hereinafter be described with reference to the accompanying drawings. In these drawings:

Fig. 1 shows, in side elevation, a first embodiment of an exhaust assembly, with its housing partly broken away;

Fig. 1A shows the exhaust assembly according to Fig. 1 with the first combustion gas flow route set;

Fig. 1B shows the exhaust assembly according to Fig. 1 with the second combustion gas flow route set;

Fig. 2 shows, in side elevation, a second embodiment of an exhaust assembly, with its housing partly broken away;

Fig. 3 shows, in side elevation, a third embodiment of an exhaust assembly, with its housing partly broken away;

Fig. 4 shows, in side elevation, a fourth embodiment of an exhaust assembly, with its housing partly broken away;

Fig. 5 shows, in sectional side elevation, a preferred embodiment of an exhaust assembly of a one-pipe construction; and

Fig. 6 shows a valve for use in an exhaust assembly according to the invention.

Fig. 1 shows in side elevation an exhaust assembly 1 comprising a feed pipe 2, a manifold 3, a first exhaust 4 and a second exhaust 5. During use, the feed pipe 2 has a first end connecting to a combustion engine, not shown, for instance a two-stroke or four-stroke engine of a motorbike or motorcar. At the opposite second end, the feed pipe 2 connects to a first connecting stub 6 of the manifold 3. At the side facing away from the first connecting stub 6, the manifold 3 comprises a second connecting stub 7 and, located thereabove, a third connecting stub 8. The first exhaust 4 connects to the second connecting stub 7, the second exhaust 5 connects to the third connecting stub 8.

The first 6 and second exhaust stub 7 are directly opposite each other, with the first flow passage therebetween being straight. In Fig. 1A, the first combustion gas flow route V_1 is shown, which in itself has a relatively low flow resistance. The first 6 and third connecting stub 8 are positioned obliquely above and/or next to each other, in such a manner that the second flow passage therebetween is curved. In Fig. 1B, the second combustion gas flow route V_2 is shown, which in itself has a relatively high flow resistance. Hence, the manifold 3 is slightly Y-shaped.

Accommodated in or adjacent the second connecting stub 7 is a valve 9 which, by means of a schematically shown servo control 10, is tiltable within the connecting stub 7 between a first extreme position in which the passage of the second connecting stub 7 is at least substantially completely released (Fig. 1A), and a second extreme position in which the second connecting stub 7 is at least substantially completely closed (Fig. 1B). Because when the valve 9 is in the first position (Fig. 1A) the flow resistance of the first combustion gas flow route V_1 is much lower than that of the second combustion gas flow route V_2, the combustion gases of the combustion engine will during use be discharged almost

entirely via the first combustion gas flow route V_1, i.e. through the first exhaust 4. Hence, the damping characteristic of the exhaust assembly is then almost entirely determined by the first exhaust 4. When the valve is in the second position (Fig. 1B), the combustion gases cannot be guided via the first exhaust 4, so that they are guided along the second exhaust 5. The damping characteristic of the exhaust assembly is then almost entirely defined by the second exhaust 5.

Fig. 6 schematically shows a valve 9 for use in an exhaust assembly according to the invention. The valve 9 comprises an annular valve seat 13 that can fittingly be disposed within for instance the connecting stub 7. The valve seat 13 comprises a top half 13A which is shifted in axial direction of the connecting stub 7 relative to the bottom half 13B of the valve seat, through a distance approximately corresponding to the thickness of the valve body 14. The valve body 14 is disk-shaped and is rotatable by means of a pivot 15 rotatably suspended in bearings 16 in the connecting piece 17 between the two valve seat halves 13A and 13B. The pivot 15 projects from the stub 7 at least on one side. Fig. 6 shows the valve body 14 in the closed position (Fig. 1B) in full lines, in the completely open position (Fig. 1A) in broken lines. In the closed position, the valve body 14 abuts against the sides of the top 13A and bottom halves 13B of the valve seat 13 that are located on the side of the pivot. Such valve 9 is easy to manufacture, incorporate and operate, is robust and little susceptible to for instance fouling, in particular carbonization, and is resistant to the exhaust pressures.

The first exhaust 4 can for instance be a standard exhaust, legally permitted in a first country, with a maximum noise volume meeting the legal requirement prevailing in that country, while the second exhaust 5 can for instance be an exhaust which is legally permitted in another, for instance adjoining, second country. For that purpose, both exhausts

are for instance provided with different mufflers 12. At a border between the two countries mentioned, the valve 9 can then be moved into one of the extreme positions by means of the switching means 10, in such a manner that the exhaust 4 or 5 allowed in the country to be entered, i.e. the combustion gas flow route V_1 or V_2, is switched on. Optionally, the valve 9 can be moved into an intermediate position, so that a first part of the combustion gases are guided via the first combustion gas flow route V_1, while the rest of the combustion gases are guided via the second combustion gas flow route V_2. This creates a combination of damping characteristics of the two exhausts 4, 5, depending on the distribution of the combustion gases. Of course, other or more exhausts can be combined as well, for instance a standard exhaust and an open-flow exhaust.

Of course, other exhausts 4, 5 can also be fitted, for instance an exhaust having a maximum damping and an exhaust having a minimum damping or an exhaust having a normal noise and an exhaust having a sporty noise. Further, by means of the valve 9, the back pressure of the exhaust assembly 1 can be controlled, which may provide an additional advantage for better engine achievements.

It is preferred when the valve 9 is driven by the servo control 10 by means of a belt drive or the like. In particular when two or more of such exhaust assemblies 1 are fitted to one vehicle, this provides the advantage that during the control of the exhaust assemblies 1, the valves 9 can first be controlled in an extreme position, for calibration, with slip of the belt drive ensuring that the valves 9 are not damaged, after which the valves 9 can be moved into the desired position. Thus, it is provided that the valves 9 all assume the same position. Moreover, it is advantageous when the or each valve 9 is or can be biased in the direction of one of the extreme positions, in such a manner that a standard or preferred exhaust is in principle incorporated into the switched-on combustion gas flow route

V, while a different exhaust must be connected consciously. This prevents a non-allowed exhaust from being switched on unintentionally.

Fig. 2 shows an alternative exhaust assembly 21, in which the first 24 and second exhaust 25 are jointly accommodated in one exhaust housing 31. In this embodiment, the valve 29, again operable by means of the servo control 30, is arranged in the integrated manifold 23, between the first connecting stub 26, the second connecting stub 27 and the third connecting stub 28. The valve 29 is adapted to direct combustion gases that are fed during use via the first connecting stub 26, in the direction of the first exhaust 24 and/or the second exhaust 25. Thus, the first and second combustion gas flow routes or a combination thereof can be switched on. Such embodiment has the advantage that it is relatively compact and has only one housing 31, which is attractive because of the outward appearance of the assembly and a vehicle provided therewith.

Fig. 3 shows a third embodiment of an exhaust assembly 41 according to the invention. In this embodiment, one exhaust 44 is provided, which exhaust directly connects to the feed pipe 42. Provided in the exhaust 44 is a substantially cylindrical muffler 52 around which a tubular shell 53 is slidably fitted. The muffler is provided with passages for the combustion gases of the engine, schematically shown by the openings 54 and the central passage 55 in the muffler 52. The shell 53 abuts against the outside of the muffler 52 in such a manner that through displacement of the shell 53, openings 54 can be closed or released. For displacing the shell 53, a servo control 50 is included again, connected to the shell 53 via a drivable pull-push rod 56. The number of passages in the muffler 52 released by the shell 53 at least partly determines the damping characteristic of the exhaust assembly 41. In this embodiment, an extremely compact exhaust assembly is obtained which is moreover of a simple construction.

Fig. 4 shows a fourth embodiment of an exhaust assembly 61, again provided with one exhaust 64 that is directly connected to the feed pipe 62. Accommodated in the exhaust 64 is again a muffler 72, which in this embodiment comprises a number of disk-shaped muffler elements 75 arranged one behind the other, in each case with the interposition of a pressure spring 76. Extending through the muffler elements 75 is a pull member 77, operable by the schematically shown servo control 70. By means of the pull member 77, for instance a pull rod, the muffler elements 75 can be pulled closer together, in such a manner that during use, the muffler 72 forms a higher flow resistance for the combustion gases of the combustion engine. When the muffler elements 75 are pulled together, the pressure springs are compressed so that when the pull member 77 is released, the muffler elements adopt the maximum mutual distances again and, accordingly, the lowest flow resistance. In this manner, the damping characteristic of the exhaust assembly is readily settable.

Fig. 5 shows a particularly advantageous one-pipe embodiment of an exhaust assembly 81 according to the invention. In this embodiment, the exhaust assembly 81 comprises one exhaust 84 that is directly connectable to the feed pipe 82, which exhaust comprises a housing 91 and a perforated tube 83 centrally arranged therein and extending in the longitudinal direction, which tube, in assembled condition, has one side connecting to the feed pipe 82 and has the other side opening into an exhaust piece 85. On the side located adjacent the exhaust piece 85, a valve 89 is provided in the tube 83, which valve in a first position closes the free passage of the tube 83 and in a second position substantially releases it. The tube 83 is surrounded with space by the housing 91, which, adjacent the feed pipe 82, closes tightly around the tube 83 and is in flow connection with the exhaust piece 85, around and downstream of the tube 83. The valve 89 is in the above-described manner operable, through servo control, between the first and the

second position. Adjacent the end located on the side of the exhaust piece 85, a number of for instance disk-shaped muffler elements 95 are provided around the tube 83, which muffler elements provide for noise adjustment and reduction and possibly power limitation when exhaust gases are guided therealong. An exhaust assembly 81 according to Fig. 5 can be used as follows.

The exhaust assembly 81 is connected to a feed pipe 82 in such a manner that combustion gases of an engine can be guided into the perforated tube 83 via the feed pipe 82. The valve 89 is then moved into the second position, enabling the combustion gases to be discharged to the environment via the tube 83 and the exhaust piece 85 practically without any resistance. In Fig. 5, this flow is shown by the arrow V1. This involves the generation of a first, relatively loud "engine" noise.

When the valve 89 is controlled so as to be partly or completely closed, the back pressure in the tube 83 is increased, whereby a part of the or all combustion gases are forced between the tube 83 and the housing 91 via the perforation openings 94 in the inner tube 83. There, these gases are subsequently forced along the muffler elements 95 and discharged, via the exhaust piece 85, to the environment. Because of the flow path V2 via the perforations and the muffler elements, a change and reduction of noise and, possibly, a reduction of power is provided. Through a suitable selection of, inter alia, the muffler elements 95 and the laminations 96 around the valve 89, a particular maximum noise volume can be set at a closed valve 89, for instance 81 dB.

In fact, in a comparable manner, several tubes can be connected around and behind one another, enabling further adjustment of noise and power. Moreover, electronic registration means can for instance be provided for measuring the noise of the engine or exhaust, while setting and

regulating means can be provided for (semi-)automatically controlling the relevant exhaust assembly.

Adjustment of the damping characteristic should at least be understood to mean adjustment of the noise level produced by or via the exhaust assembly and/or the back pressure provided for the engine by the exhaust assembly, both during the use of the exhaust assembly.

An exhaust assembly according to the invention is in particular suitable for use with a motorbike, a moped or a motorcar. This may involve different assemblies being used side by side, for instance one per cylinder of the engine of the relevant vehicle, or in an integrated manner.

The invention is by no means limited to the embodiments shown and described in the drawings and the specification. Many variations thereto are possible.

For instance, three or more exhausts having different or comparable damping characteristics may be used, while switching means may be provided for switching on each of the exhausts separately or combinations thereof. Moreover, different combinations of the features given in the specification and the claims are possible in manners speaking for themselves. Various other means for adjusting the damping characteristic of an exhaust assembly in a comparable manner may be used, depending on the type of exhaust opted for. In particular when an exhaust assembly according to the invention is used with a motorcar, the means for controlling the damping characteristic may be incorporated downstream of the first and any further mufflers (dampers) and a catalyst, if any, which saves costs and space.

These and many comparable modifications and variations are understood to fall within the framework of the invention.

Claims

1. 1. An exhaust assembly for use with a motor vehicle having a combustion engine, said exhaust assembly comprising combustion engine-connecting means, at least one exhaust and at least one muffler, wherein means are provided for controlling the damping characteristic of the exhaust assembly, **characterized in that** the exhaust assembly (1,21,41,61,81) comprises at least a first combustion gas flow route V_1 and a second combustion gas flow route V_2, wherein the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77; 89) for controlling the damping characteristic are operable during use of the exhaust assembly with a combustion engine coupled thereto and are adapted to guide the combustion gases of the engine at least partly along one of the combustion gas flow routes.

2. An exhaust assembly according to claim 1, characterized in that the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77; 89; 83; 94,95) for controlling the damping characteristic comprise diversion means (9; 29; 53; 75,76,77; 89) for diverting, during use, at least a portion of the exhaust gases coming from the combustion engine past at least a portion of the muffler (12; 32; 52; 72; 95) or at least one of the mufflers, so that during use, through actuation of the diversion means, the measure of influence of the or each muffler on the damping characteristic of the exhaust assembly (1; 21; 41; 61; 81) and, accordingly, at least the noise produced by or in the exhaust assembly is controllable.

3. An exhaust assembly according to claim 1 or 2, characterized in that the assembly (1,21) comprises at least two exhausts (4,5; 24,25), wherein the control means comprise at least switching means (3,9; 23,29) between the combustion engine connecting means (2,22) and the exhausts (4,5; 24,25), said switching means being adapted to selectively bring one,

a series or each of the exhausts (4,5; 24,25) into flue gas-connection.

4. An exhaust assembly according to claim 3, characterized in that the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77) for controlling the damping characteristic comprise a manifold (3,23) that is on one side connected to the combustion engine connecting means (2; 22) and on the other side provided with at least two separated connecting means (7,8; 27,28) to which in each case at least one exhaust (4,5; 24,25) is connected, wherein the switching means comprise valve means (9; 29) extending in the manifold (3; 23) for at least partly closing or releasing at least one of the connecting means (7,8; 27; 28).

5. An exhaust assembly according to claim 4, characterized in that the manifold (3; 23) forms at least a first connection between the combustion engine connecting means (2; 22) and a first exhaust (4; 24) and a second connection between the combustion engine connecting means (2; 22) and a second exhaust (5; 25), wherein the flow resistance of the first connection is lower than the flow resistance of the second connection, wherein the valve means (9; 29) are designed so as to be able to close the first connection at least substantially.

6. An exhaust assembly according to claim 5, characterized in that the first connection is substantially straight.

7. An exhaust assembly according to claim 1 or 2, characterized in that the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77) for controlling the damping characteristic comprise covering means (53) for closing at least a portion of the or each muffler (52) for through-flow by the flue gases, in such a manner that through actuation of the covering means (53) a smaller or larger part of the relevant muffler (52) is flown through by the flue gases during use.

8. An exhaust assembly according to claim 7, characterized in that the or each muffler (52) has an elongated shape, wherein the flue gases, during use, flow from the outside

through passages (54,55) into the muffler and flow through the muffler to the outlet side of the exhaust (44), wherein the covering means comprise a shell-shaped part (53) slidable over the muffler (52) for closing at least a part of the passages (54,55).

9. An exhaust assembly according to claim 1 or 2, characterized in that the or each muffler (72) comprises a number of lamination-shaped muffler elements (75) arranged one behind the other in the longitudinal direction of the muffler, wherein during use, the flue gases flow between the muffler elements (75) in the direction of the outlet side of the relevant exhaust (74), wherein the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77) for controlling the damping characteristic comprise switching means (70,77) for moving at least a number of the muffler elements (75) relative to each other in the longitudinal direction of the muffler (72), in such a manner that the size of the passages between the muffler elements (75) is adjusted thereby.

10. An exhaust assembly according to claim 1 or 2, characterized in that the exhaust assembly comprises a gas-tight housing (91) comprising, spaced therefrom, a perforated inner tube (83), wherein the housing is on one side closed around the inner tube (83) comprising connecting means for a combustion gas feed pipe (82), wherein, spaced from the connecting means, valve means (89) are incorporated for closing the inner tube (83) completely or partly, the arrangement being such that when the valve means (89) are open, the first combustion gas flow route (V_1) extends through the inner tube (83) to the environment, while when the valve means (89) are closed, the second combustion gas flow route (V_2) extends, via the inner tube (83) and the perforation openings (94) provided therein, between the inner tube (83) and the housing (91) to the environment.

11. An assembly according to any one of the preceding claims, characterized in that the means (3,9,10; 23,29,30; 50,53,56; 70,75,76,77; 89) for controlling the damping

characteristic are remotely controllable, preferably electrically or hydraulically.

12. Diversion and switching means for use in an exhaust assembly according to any one of the preceding claims.

13. A manifold for use in an assembly according to any one of claims 1-11.

14. A vehicle provided with an exhaust assembly according to any one of claims 1-11.

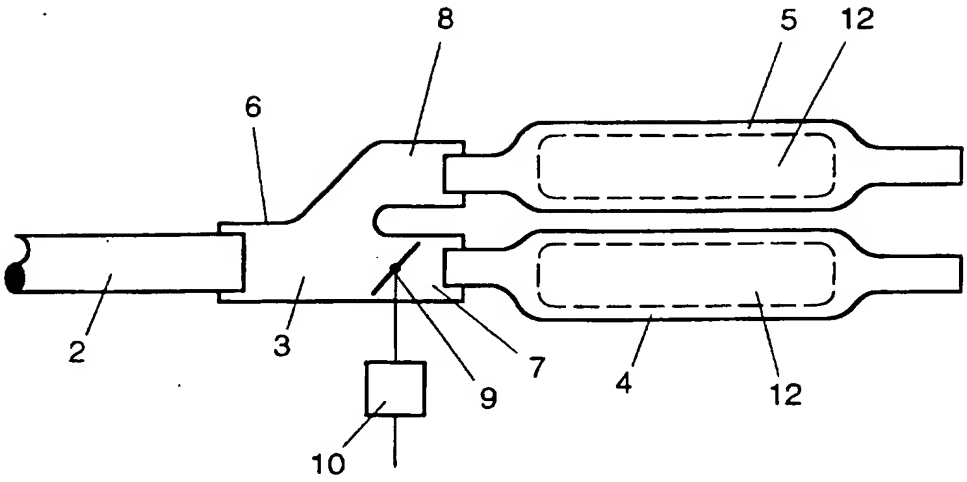


Fig. 1

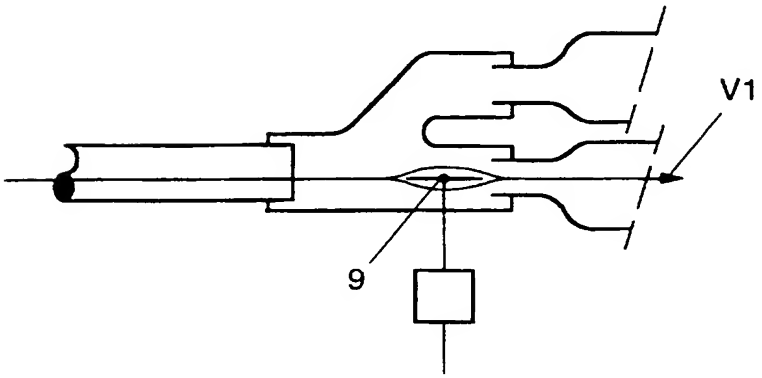


Fig. 1A

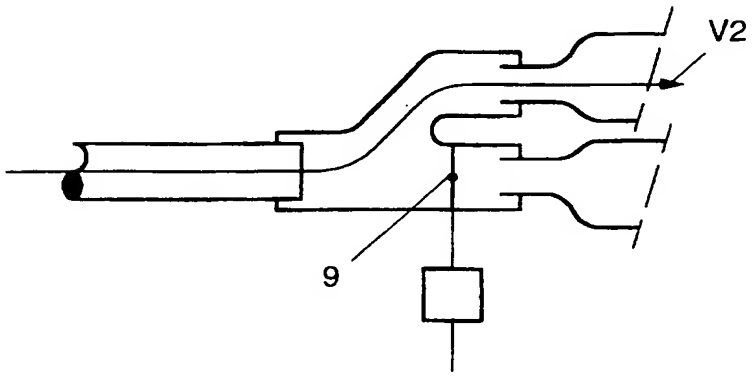


Fig. 1B

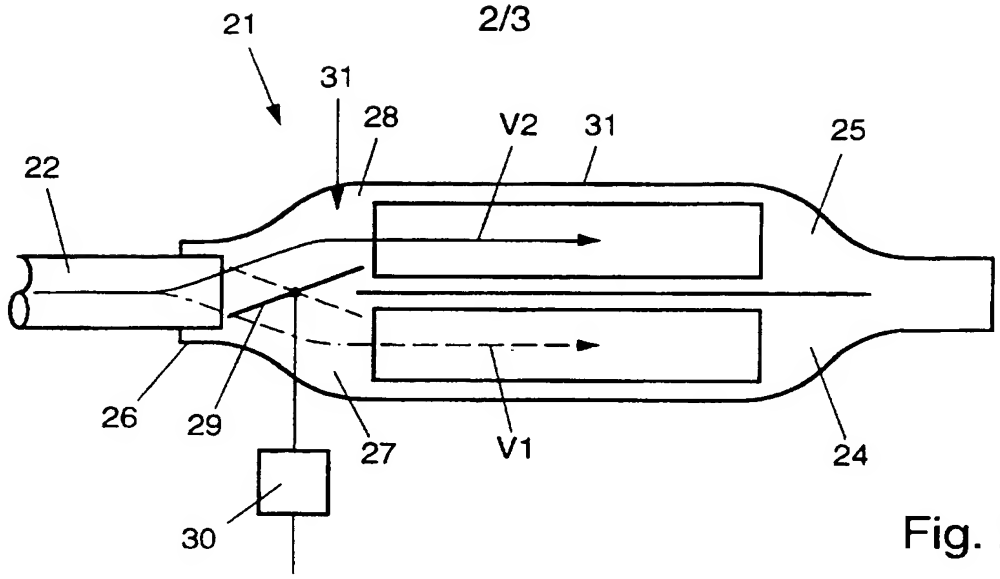


Fig. 2

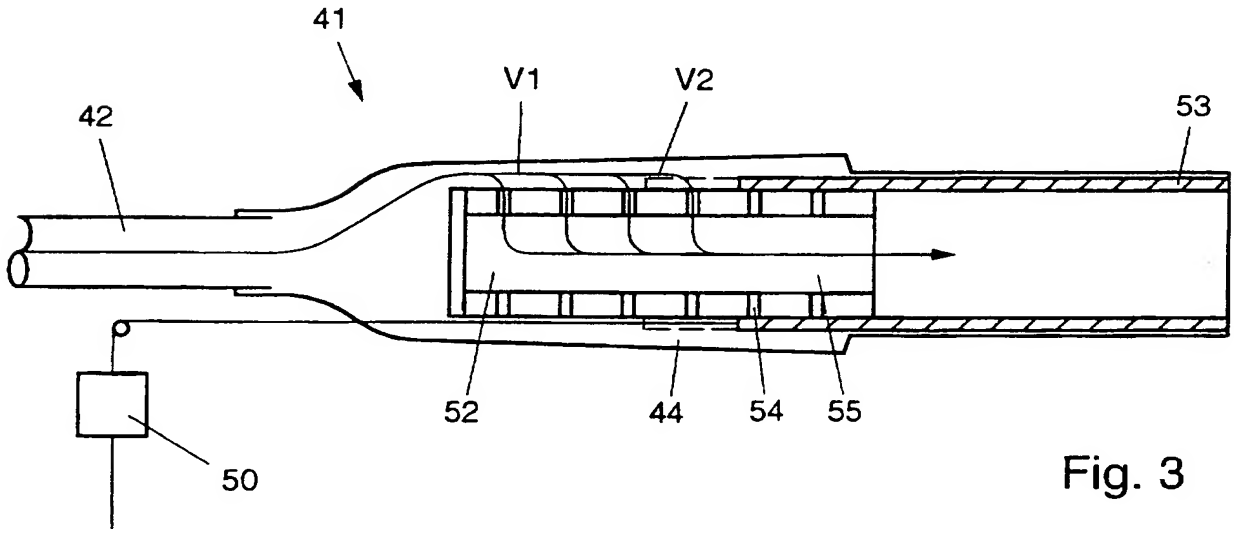


Fig. 3

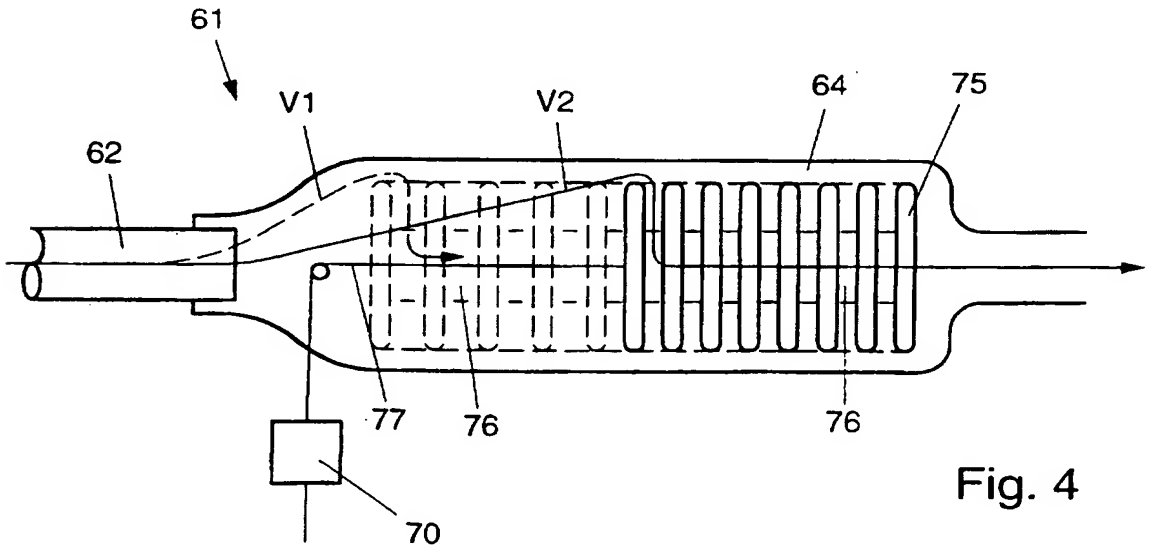


Fig. 4

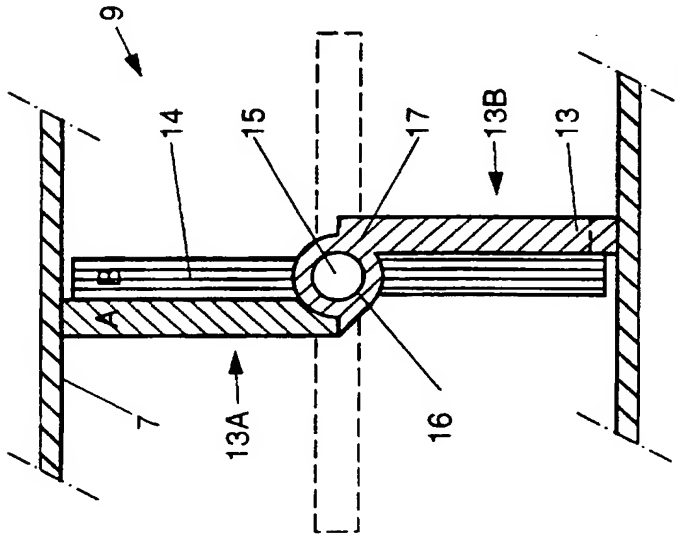


FIG. 6

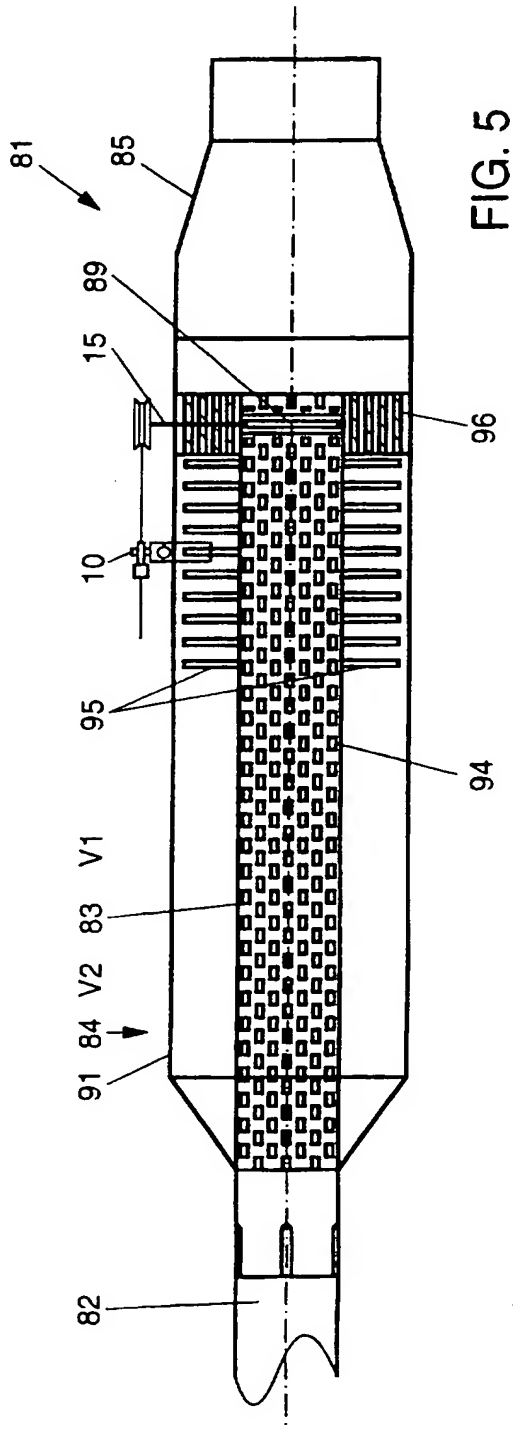


FIG. 5

INTERNATIONAL SEARCH REPORT

Inten ial Application No
PCT/NL 97/00204

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F01N1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 901 528 A (SAIGO ET AL.) 20 February 1990 see abstract see column 2, line 32 - column 3, line 32; figures 1-3 ---	1-3,11, 12,14
X	US 1 591 088 A (HOLMES) 6 July 1926 see page 1, line 23 - line 25 see page 1, line 68 - page 2, line 20; figure 1 ---	1-6, 12-14
X	FR 764 504 A (CLAUDE) 23 May 1934 see page 1, line 1 - line 6 see page 2, line 9 - line 20; figure 3 --- -/--	1,2,7, 12,14

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
10 July 1997	14.07.97

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Van Zoest, A

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/NL 97/00204

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 25 14 689 A (MOOS) 14 October 1976 see page 1, paragraph 2 see page 7, paragraph 2 - page 8, paragraph 4; figure 1 see claim 1 ---	1,2,9, 12,14
X	US 2 072 372 A (KINGSLEY) 2 March 1937 see page 1, column 1, line 1 - line 6 see page 2, column 1, line 5 - line 53; figures 1,2 -----	1-3, 10-12,14

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inten ial Application No
PCT/NL 97/00204

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4901528 A	20-02-90	JP 1182515 A JP 7088770 B	20-07-89 27-09-95
US 1591088 A	06-07-26	NONE	
FR 764504 A	22-05-34	NONE	
DE 2514689 A	14-10-76	NONE	
US 2072372 A	02-03-37	NONE	